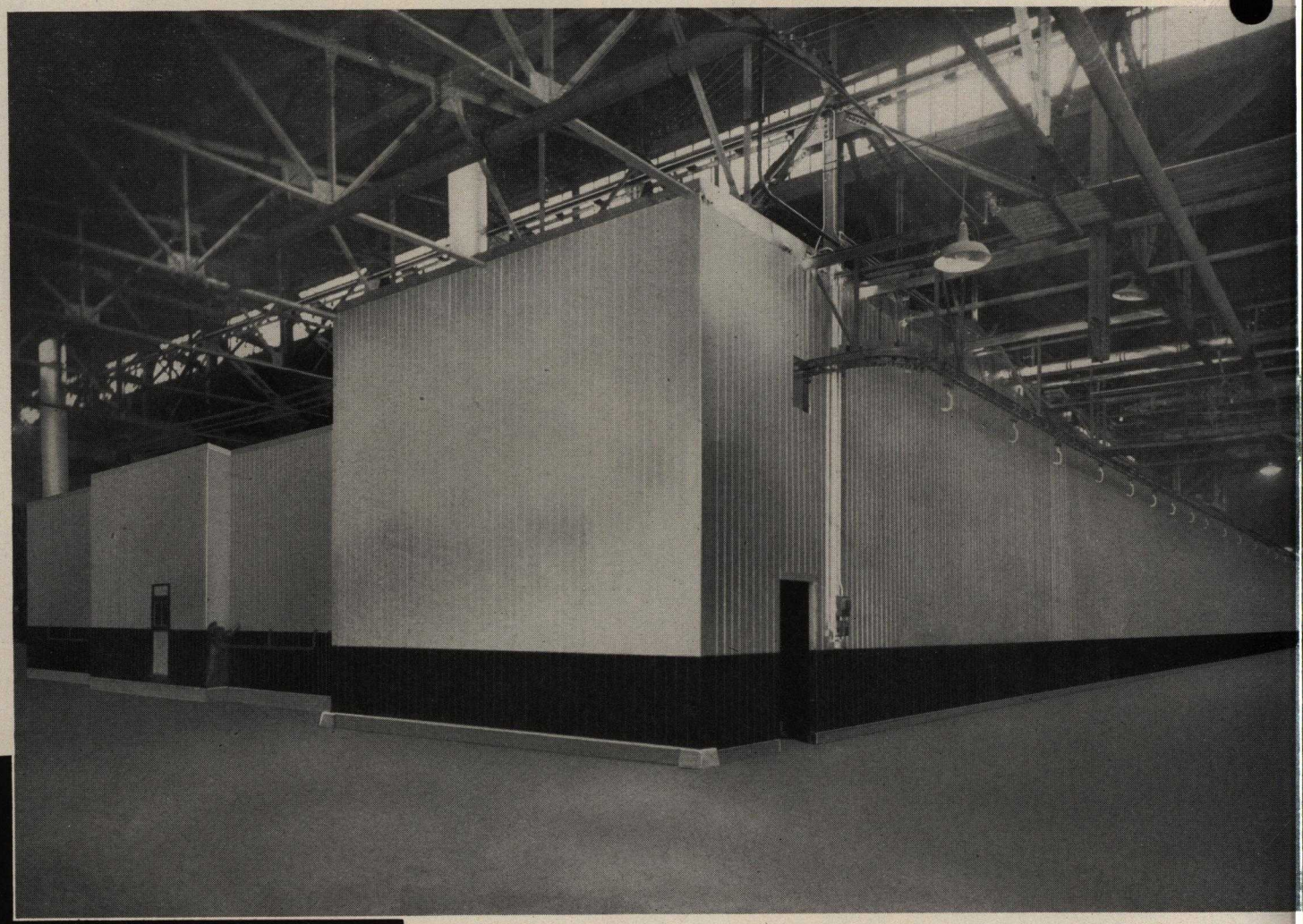
A. I. A. File Num 25-C-31

TRUSCON STEEL WINDOWS *Bonderized* RESIST RUST

NEW BAKED ON PAINT FINISH IS SMOOTH AND DURABLE. PRIMING COAT LASTS THREE TO FIVE TIMES LONGER



Interesting Note: The sidewalls of the Truscon Bonderizing Unit consist entirely of Truscon Ferrobord Roofdeck sheets.

TRUSCON facilities for Bonderizing

Again Truscon Steel Company, world's largest manufacturer of steel building products, moves forward with American Industry in the scientific war against metal corrosion and in protection of painted metal surfaces. Truscon has installed complete equipment for Bonderizing...the well known rust-resisting process used by automobile manufacturers and others to hold paint to steel and make steel resistant to the formation and progress of rust.

In the building industry, certain products of steel are exposed to seasonal variations of temperature and climatic changes. It is evident that Bonderizing, plus the Truscon method of "baked-on" finish provide highly efficient protection for the priming coat on Truscon steel building products.

Naturally not all of Truscon's line of building products will be Bonderized. The application of this process will be confined to products that, under conditions of their final installation, will be exposed to those factors known to be detrimental to continued efficient and economical service.

You can now specify Truscon Bonderized Steel Windows and such other products which, by reason of their size can be accommodated with existing equipment. You are assured that the baked-on priming coat of paint as well as the steel itself is given the greatest practical protection for long life and low maintenance cost.

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The Bonderizing Process
What it *Is* . . . and what it Accomplishes

To specifiers and users of steel building products, fine appearance is often a vital problem. Paint alone, regardless of its method of application or the manner in which it is dried, is inadequate for products that will be subjected to severe exposure. The inherent nature of the underlying metal to corrode has caused premature paint failure through chipping and peeling.

The difficulty of maintaining paint finishes is due to two main causes—corrosion of the underlying metal and lack of adhesion of the paint film to the metal. It was to overcome these difficulties in finish maintenance that Truscon installed Bonderizing equipment.

The function of the Bonderite Process is to provide steel with a rust resisting coating of the proper texture adapted to increasing the adhesion and durability of the paint film that would be applied over it.

The Bonderizing Process is a method of chemically producing a phosphate coating on iron and steel that is composed of millions of microscopic crystals, integral with the metal itself and, as such, has greater adherence than any other known protective covering. Being insoluble in water, this coating effectively retards corrosion resulting from moisture that may penetrate the paint film and provides a foothold for the paint, which prevents flaking or peeling. The finishing material flows into the interstices between the fine crystals and, when dry, is securely anchored to the metal. The Bonderizing chemical is a concentrated compound which, when dissolved in hot water, forms a solution that reacts quickly to form a phosphate coating on properly cleaned iron and steel. Due to Truscon's modern Bonderizing equipment, process time is rapid.

The Bonderite coating is velvety in texture, opaque and neutral gray in color. It is softer than the base metal and is adherently etched into the metal surface. It is especially well adapted to obtaining uniform color effects in final finishes.

The Bonderite Process offers the most satisfactory surface for painting. It not only provides for increased adhesion and durability of finishes applied over it, but provides a check on the cleaning operations as well. It removes the last traces of grease and drawing compounds, neutralizes any residual alkali or surface rust remaining on the work and eliminates hand marks that may have occurred prior to processing.

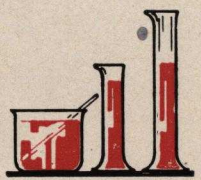
The Theory of Bonderizing

The formation of the Bonderite coating on metal depends upon the fact that phosphoric acid solutions will dissolve ferrous phosphate within certain definite limits in direct proportion to the concentration of the acid present. The addition of iron or steel products to such a solution results in the precipitation of the Bonderite coating on the metal surface at the point of solution. The reaction takes place with the evolution of hydrogen, continuing until the metal surface is completly converted to a crystalline phosphate coating.

The processing bath is prepared by dissolving the necessary Bonderite chemicals in hot water and immersing therein the properly cleaned metal for an interval of from two to five minutes, which is sufficient to transform the metal surface to a phosphate coating. Following the processing operation, the articles are rinsed and dried before painting.

The Bonderizing solution contains free phosphoric acid, metallic acid phosphates and an accelerator in the proper proportions to produce the phosphate coating in the shortest possible time.

The concentration of the processing solution is controlled by titrating the amount of acid present in a given sample, using standard sodium hydroxide and phenolphthalein as indicator. As metal is treated in the bath, its concentration is reduced and it is then necessary to replenish from time to time with Bonderite chemicals to maintain its operating efficiency.



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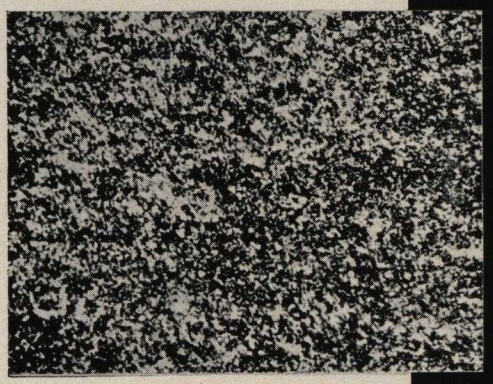
No. 1—Photomicrograph of plain steel, enlarged 100 times. The surface is glossy smooth with no porosity to afford a bond for the applied coating. There is little to which paint can cling.



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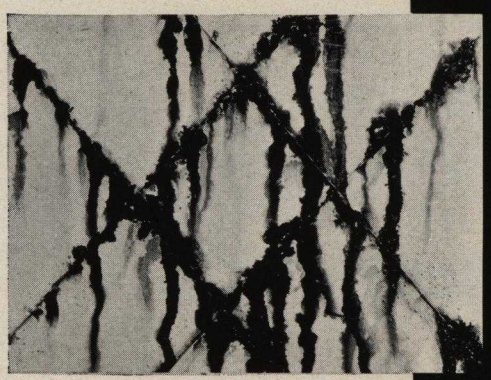
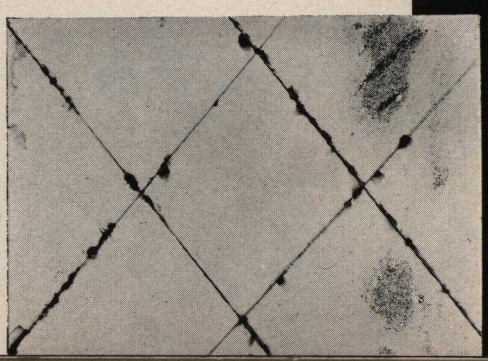
No. 2—Photomicrograph of steel with Bonderite coating, enlarged 100 times. The spaces between the crystals act as microscopic pores. Paint when applied to this base quickly penetrates and as it dries is firmly anchored to the steel.



3

Nos. 3 and 4—Photographs of two test panels of flat steel subjected to salt spray (20% solution) for more than 700 hours. Panels and finishing are identical except that panel No. 3 was acid cleaned while panel No. 4 was Bonderized before painting.



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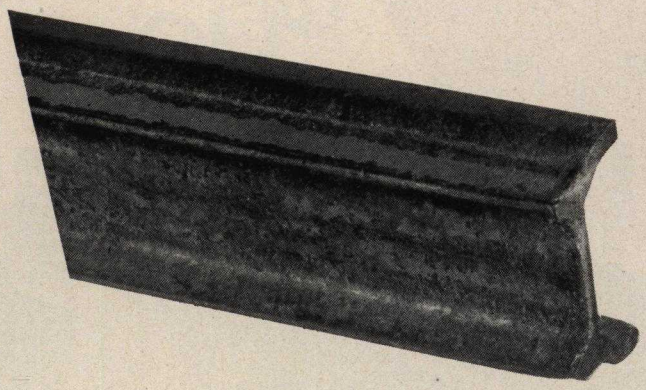
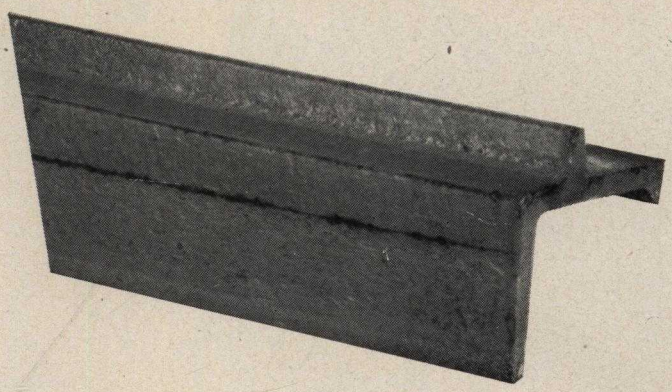
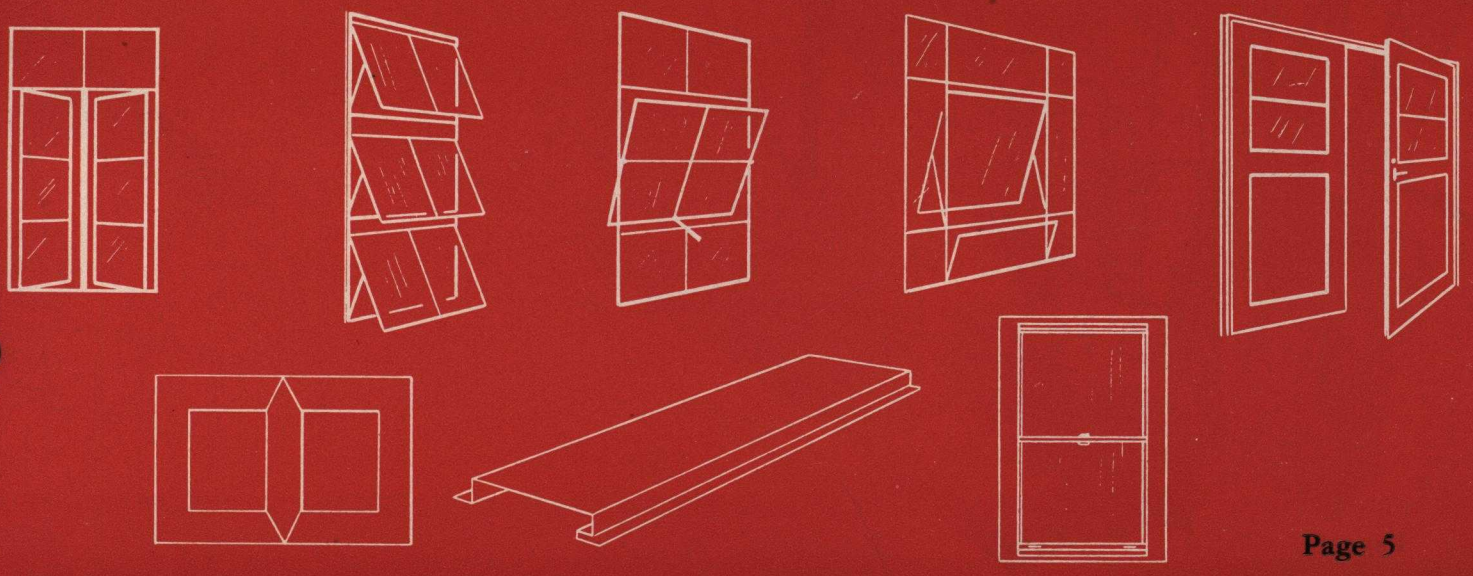


ABOVE: Steel Window Section painted but not Bonderized; after 138 hours of salt spray test.
BELOW: Truscon Steel Window Section, Bonderized and painted; after 228 hours of salt spray test.

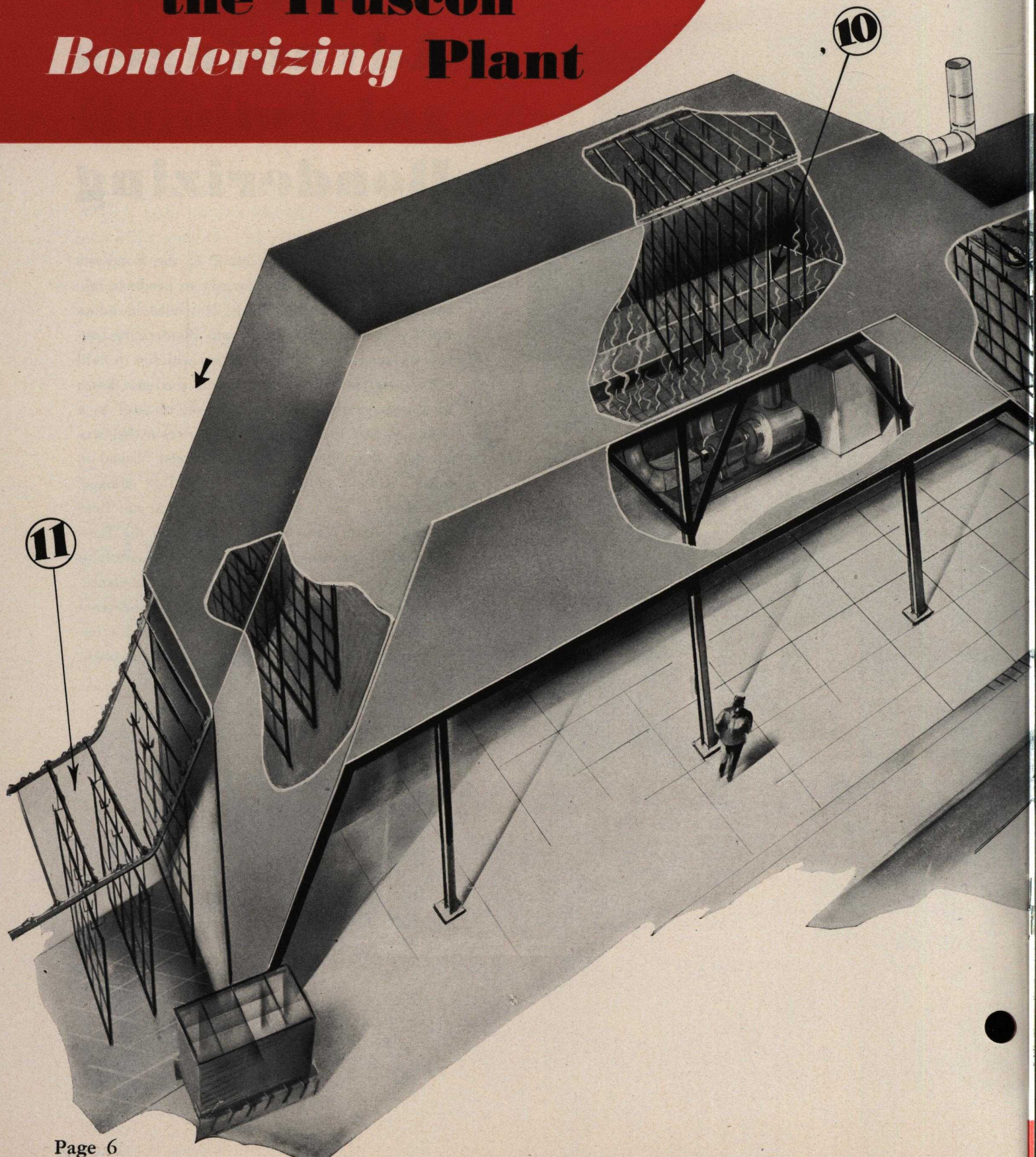


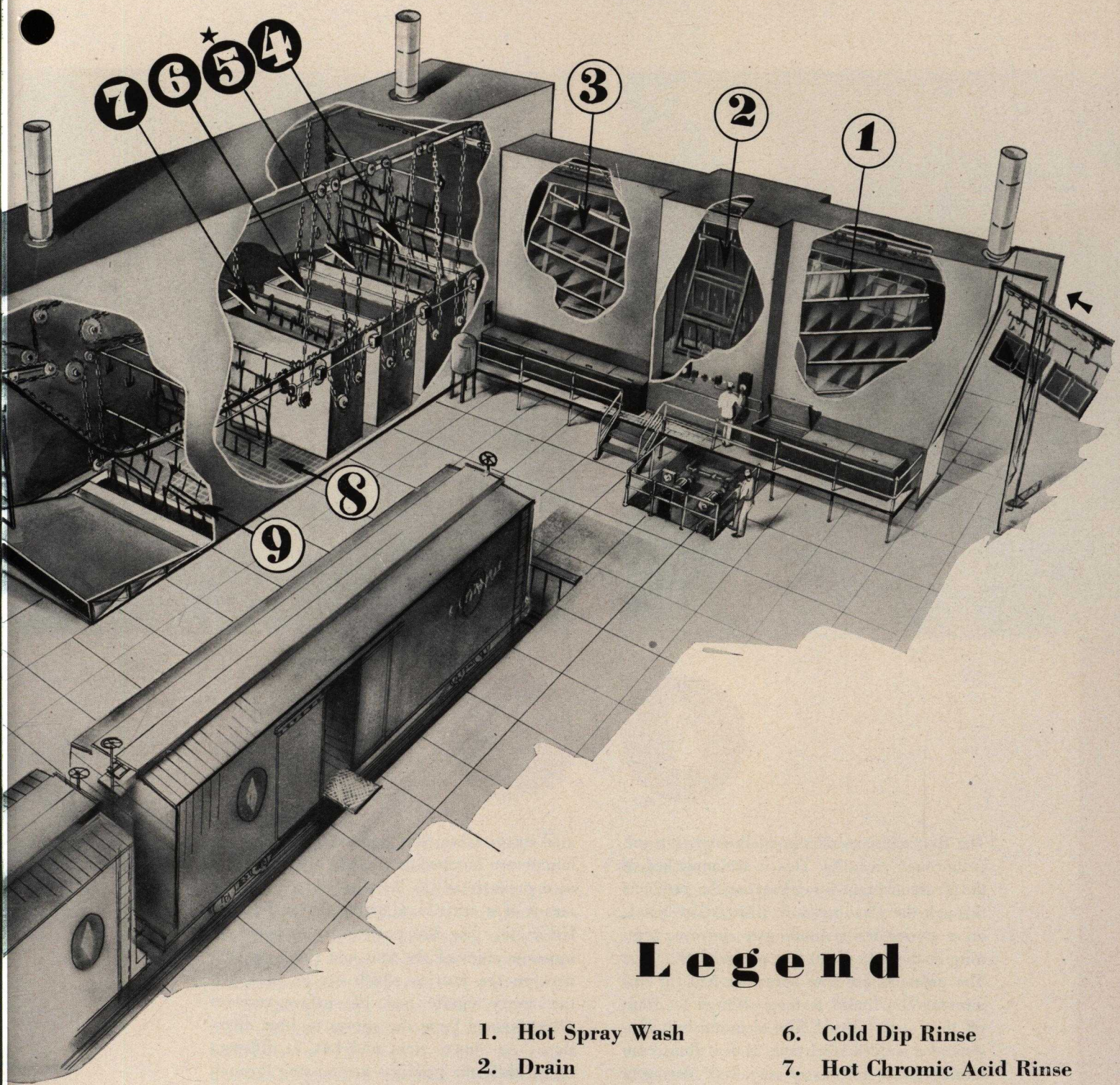
Proof of the Advantages of Bonderizing

From its inception, application of the Bonderite Process has been confined largely to products fabricated from flat-rolled sheets. Not until its adoption by the building industry was Bonderizing considered importantly in conjunction with hot or cold rolled steel sections. The window sections shown on this page illustrate the reaction of steel to a sustained salt spray test. The test section that was Bonderized and painted by the Truscon "baked-on finish" method shows barely perceptible damage. The effect of the test on the painted but not Bonderized section is obvious. The ability of the Truscon-applied priming coat of paint to withstand such rigorous exposure assures long maintenance-free service under normal conditions. Bonderized Truscon Steel Windows are now available for immediate shipment from our factory in Youngstown.



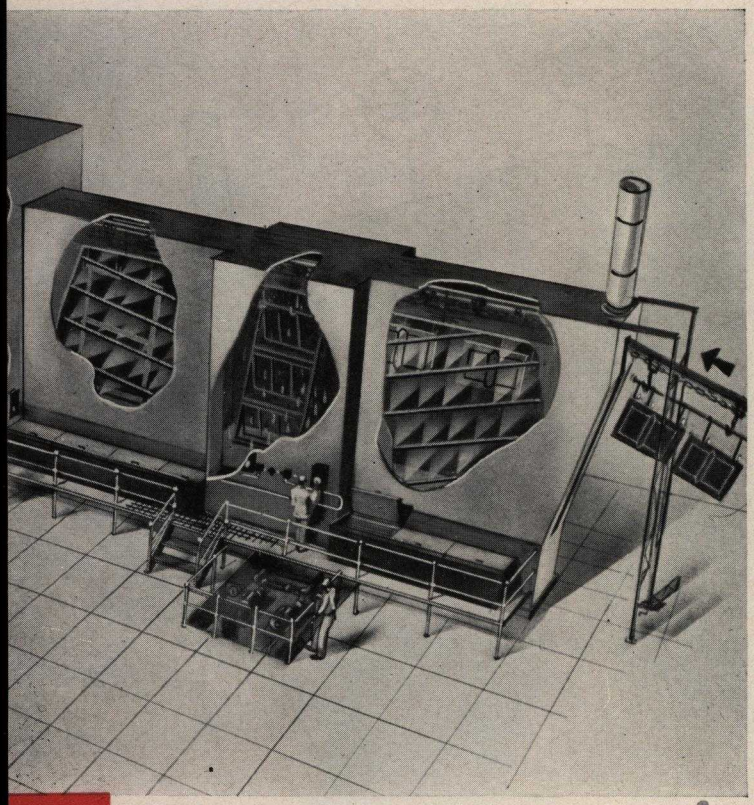
A Pictorial Trip through the Truscon *Bonderizing* Plant

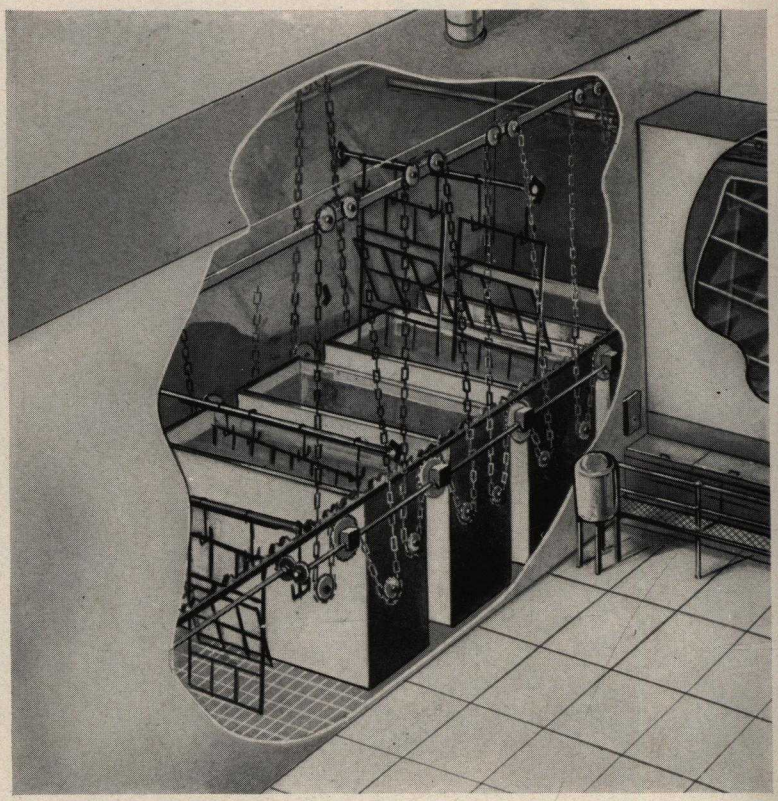




Legend

1. Hot Spray Wash
2. Drain
3. Hot Spray Rinse
4. Hot Dip Rinse
★5. Bonderize
6. Cold Dip Rinse
7. Hot Chromic Acid Rinse
8. Dry and Cool
9. Dip Paint and Drain
10. Dry and Bake
11. Cool

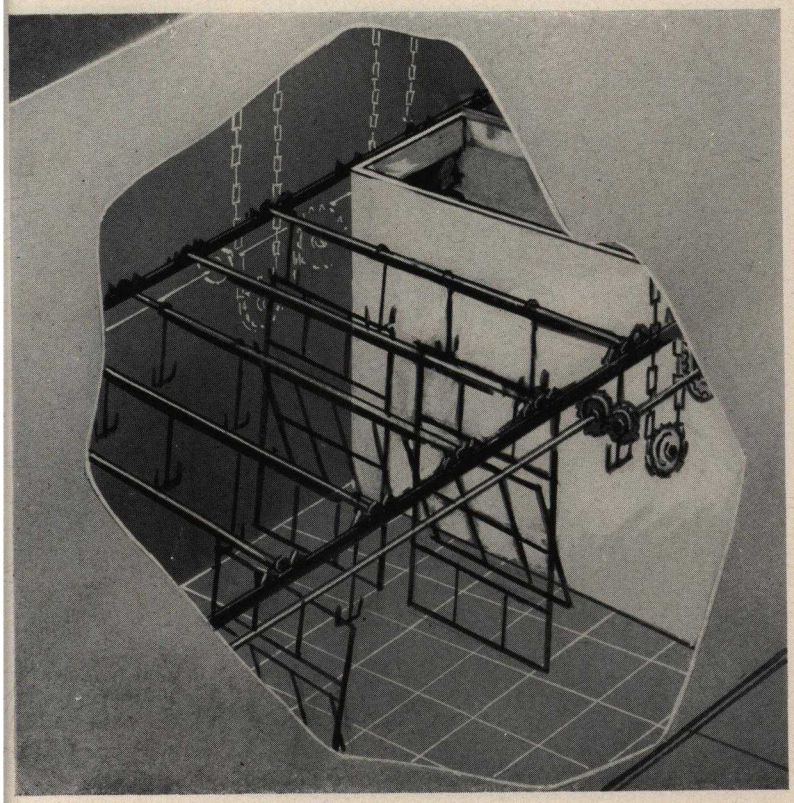


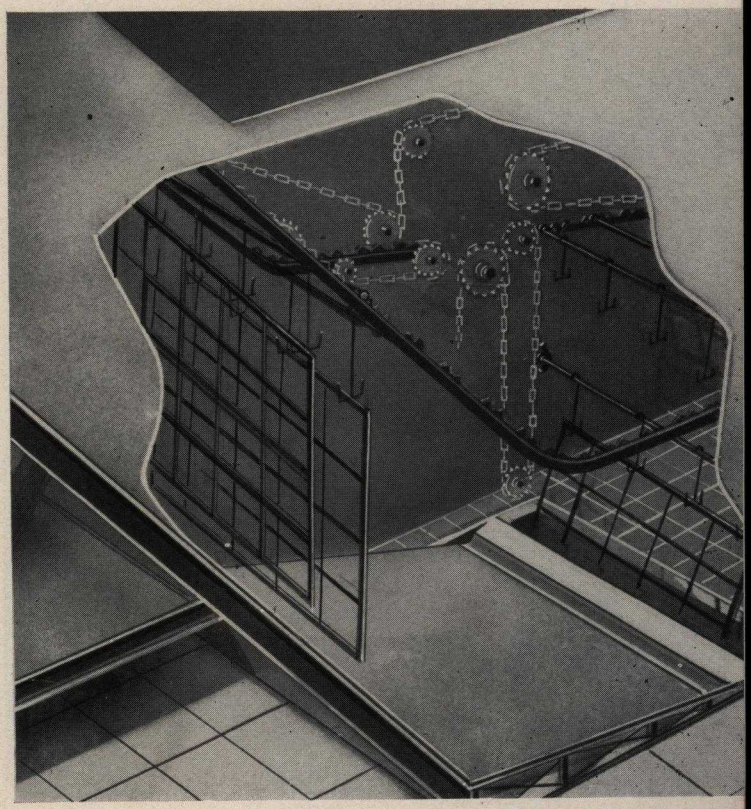


1 2

The first requisite of a good Bonderizing job is thorough cleaning. This is accomplished in the Truscon plant by conveying the products through the cleaning unit, illustration No. 1, on a power-driven mono-rail conveyor running at the rate of 20 feet per minute.

The products are first spray washed for one minute. The liquid is then allowed to drain off then spray rinsed. The cleaning unit consists of a welded steel tank 21 feet long, containing 2500 gallons of an alkali detergent solution heated to 180 degrees Fahr. by means of submerged steam coils carrying saturated steam at 125 lbs. pressure. The temperature of this solution is automatically controlled by means of an indicating control thermometer, actuating an electrically operated steam valve. 900 gallons of solution per minute are pumped through 300 spray nozzles at a pressure of 25 lbs. per square inch by means of a centrifugal pump driven by a 20 HP motor. The 300 nozzles are disposed on opposite sides of the unit and products pass between the nozzles which are so arranged that every square inch of surface receives direct impact from the sprays in four directions—up, down, right and left, at different times while the products are passing through the wash unit. After washing, the products ride for one and one eighth minutes through a draining zone where the washing solution drains off. Products then pass through the rinse unit which is an exact duplicate of the wash unit with the exception that the rinsing





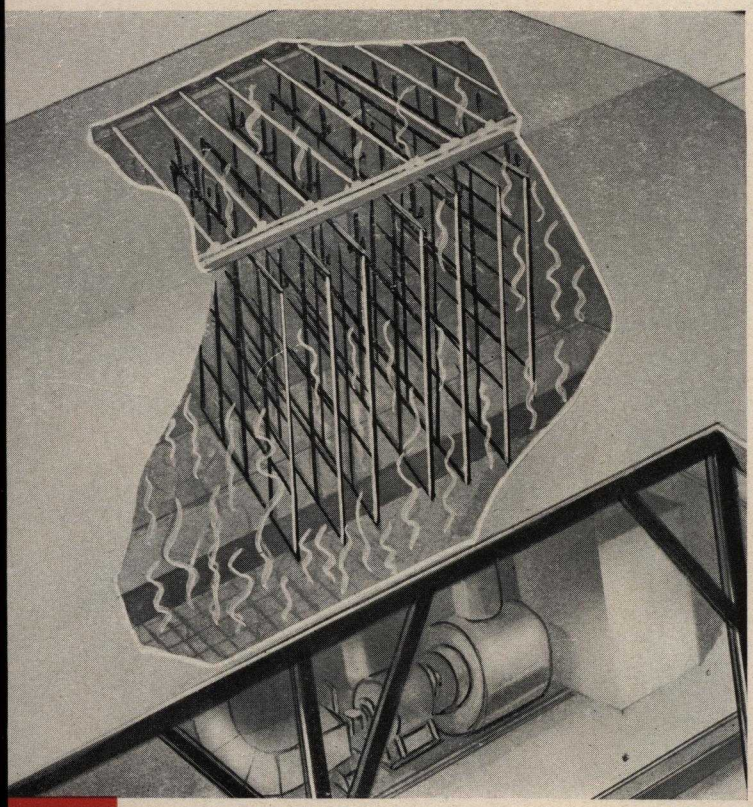
3 4

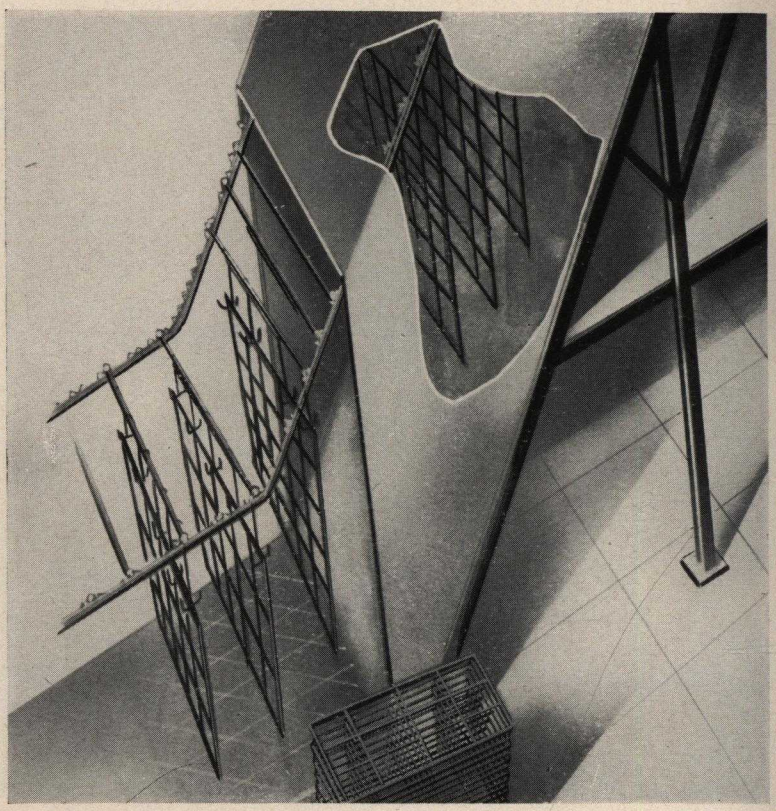
medium is pure water automatically controlled at 180 degrees Fahr.

The products are then automatically transferred to a double chain conveyor that carries them through the processing unit, illustration No. 2, where the following operations are automatically performed in sequence.

1. Submerged for forty five seconds in 5800 gallons of pure water, automatically controlled at 180 degrees Fahr. to assure absolute removal of the least trace of alkali.
2. Submerged for three minutes in 9500 gallons of Bonderite solution, automatically controlled at 180 degrees Fahr. where the action of the hot chemical produces a light gray crystalline phosphate coating on the surface of the steel. This velvety film is an ideal surface for painting, assuring tight, even adhesion of paint.
3. Then submerged for one and one eighth minutes in 5800 gallons of cold water to remove any excess of Bonderite chemical.
4. Submerged for one and one eighth minutes in 5800 gallons of a dilute chromic acid solution at 200 degrees Fahr. to assure an acid surface for painting.

As products are removed from the chromic acid tank, they pass through a steam curtain that blows off all excess liquid and applies heat to facilitate drying. Each of the tanks in which the above four operations are carried on is constructed of one-quarter inch boiler plate with electric welded seams. The Bonderite tank is lined with 14 gauge Repub-





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6

lic Enduro Stainless Steel.

After leaving the processing unit, products ride for twenty two and one half minutes through a cooling and drying zone, illustration No. 3, at the rate of 20 inches per minute. This cools them to room temperature and allows them to dry before painting. When dry, the products proceed to the 2300 gallon dip-painting tank, illustration No. 4, where they are submerged and thoroughly coated with paint compounded to Truscon's exacting specifications. The paint is circulated constantly at the rate of 60 gallons per minute through a filtering and tempering tank to assure clean paint at constant temperature and uniform viscosity.

Products are then conveyed for 18 minutes over a drip board, where all excess paint drains off.

The temperature in the bake oven, illustration No. 5, is automatically controlled at 250 degrees Fahr. by means of a control thermometer and an electrically-operated gas valve. Hot air is constantly circulated by a centrifugal fan driven by a 5 HP motor. The products are in the heated zone for forty-five minutes where the prime coat is dried thoroughly and baked. After leaving the bake oven, products ride for fifteen minutes through a cooling zone, illustration No. 6, which again reduces them to room temperature. They are then automatically transferred to the monorail conveyor and carried directly to the shipping platform.

Questions and Answers

1. Q—What is the difference between Bonderizing and (a) Parkerizing, (b) Galvanizing, (c) Sherardizing and (d) Cadmium Plating?

   A—Bonderizing and Parkerizing are chemical treatments in which the surface treated is converted from a metallic to a non-metallic phosphate coating. The other three processes mentioned in the question consist of the deposition of corrosion-resistant metals upon the surface to be protected.

2. Q—What is the difference between Parkerizing and Bonderizing?

   A—The Bonderizing and Parkerizing processes, developed by Parker Rust-Proof Company, provide a rust-inhibiting surface for the application of paint. The only difference between these two processes is the amount of time necessary for the chemicals to convert a metallic surface to a non-metallic phosphate coating. The chemicals used in the Bonderizing process react much more rapidly in forming the rust-inhibitive surface on the steel. Through this quicker action of Bonderizing, more rapid production schedules can be maintained and ultimate cost to the consumer reduced.

3. Q—Is Bonderizing a rust preventive as long as the protective surface is not abraded?

   A—As long as the paint coating remains intact, Bonderizing provides a corrosion inhibiting coating. When the paint film is penetrated, rust will develop in the wound but Bonderizing will prevent its spread to surrounding areas.

4. Q—In practical terms, will factory Bonderizing of steel products actually save money by reducing the frequency of painting?

   A—Bonderizing will reduce the frequency of painting steel products as exposure tests have demonstrated. The paint will have from three to five times greater life when applied over Bonderizing as compared to ordinary plain steel surfaces. Not only will the Bonderizing reduce the expense of repainting, but it will also effect economies in the expense of preparing the products for repainting. It is well recognized that the expense of removing old paint and rust and getting the surface ready for repainting requires greater time and expense than the application of the paint itself. The Bonderite coating, being corrosion-inhibiting and retarding the spread of rust at areas in which the paint film breaks down, makes it possible to refinish the products with considerable savings.

A Specification for Steel Windows Bonderized

and with baked on paint finish

After fabrication, the windows shall be thoroughly spray washed in a hot alkali solution to remove all oil, grease and foreign matter, spray rinsed in hot water to assure a clean, grease-free surface for chemical treatment. They shall then be dip-rinsed in hot water, processed by dip Bonderizing, rinsed in cold water and dipped in a dilute solution of chromic acid.

Windows shall be immediately air-dried to insure uniform temperature for painting. Paint shall be particularly adapted to application by dipping at a uniform, controlled temperature. Paint to be of a character especially adapted to materials coated with phosphates. Painting and oven baking shall be a part of the continuous process.

Windows shall be oven-baked for at least 45 minutes at a temperature of not less than 250 degrees. Painting and oven-baking must be done at the plant of the processor.

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Youngstown 1, Ohio.....Albert Street

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SUBSIDIARY OF REPUBLIC STEEL CORPORATION
YOUNGSTOWN, OHIO
Factories: Youngstown, Ohio; Cleveland, Ohio; Canton, Ohio; Gadsden, Ala.; Walkerville, Ont., Canada

PRINTED IN U. S. A.
NO. A-350 REPRINT 5-47

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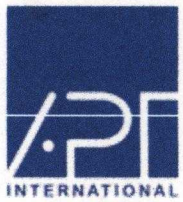

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